ATTACHMENT
REDLINED AMENDMENT

Prior to examination, please amend the above-identified reissue application as follows:

In the Specification

Please replace the paragraph beginning at column 3, line 42 with the following:

The motor is affixed to the top of the drive housing and connects directly to the rotor as described above. The motor in [this] the preferred embodiment is a standard frame [17] stepper motor, but may be any suitable drive device, such as a DC motor, AC motor, or servo motor. It may be desirable for the electronic system to be able to receive feedback on the position of the diaphragms. This is accomplished by attaching a switch of optical or mechanical means to a threaded drive shaft attached with a coupling to the rear shaft of the motor. This threaded shaft will drive a cam in the vertical directions. The switch and cam are arranged so that when the valve is closed to fluid the switch will also be closed. This feedback signal can be used by the controlling electronics, if necessary to sense the closed position. Alternatively, a potentiometer or other encoder may be so attached to provide continuous feedback to the controller.

After the heading "DETAILS OF INVENTION" and before the paragraph beginning at column 4, line 14, please insert the following:

Throttling valve 20 generally includes valve body 22, flexible diaphragm structure 24, and drive assembly 26. Valve body 22 has inlet passage 28 and outlet passage 30 fluidly connected through fluid cavity 32. Inlet passage 28 and outlet passage 30 have threaded portions

34, 36, respectively, for connecting with fluid piping (not depicted). Valve body 22 may be made from a solid block of PTFE or other chemically resistant polymer material.

Upwardly facing valve seat 38 in the form of projecting island 40 surrounds the entrance 42 to inlet passage 28 in fluid cavity 32. Projecting island 40 is generally annular and has an outer surface 44 with a top portion 46 and an outer peripheral surface portion 48.

Flexible diaphragm structure 24 generally includes primary diaphragm 50, secondary diaphragm 52, valve portion 54, and threaded stem 56. Primary diaphragm 50 has a central portion 58, a thin walled portion 60, and a thicker shoulder portion 62. Secondary diaphragm 52 has a central portion 64, which fits over central portion 58 of primary diaphragm 50, a thin walled portion 66, and a thicker shoulder portion 68. Primary diaphragm 50 and secondary diaphragm 52 mate at shoulder portions 62, 68. Thin walled portions 60 and 66 are spaced apart, defining internal volume chamber 70 in flexible diaphragm structure 24. Weep hole 71 may be provided, extending from internal volume chamber 70 through valve body 22 to the atmosphere.

Valve portion 54 is defined in bottom surface 72 of flexible diaphragm structure 24, and generally includes an annulus 74 defining a recess 76. Recess 76 has inner surface 78, which includes a flat portion 80 and an inner peripheral surface portion 82. Recess 76 is the female form of projecting island 40 and is sized so as to snugly receive projecting island 40 therein. When projecting island 40 is received in recess 76, inner peripheral surface portion 82 confronts outer peripheral surface portion 48 of projecting island 40.

Drive assembly 26 generally includes drive housing 84, drive train 86 and operator 88. Drive housing 84 is firmly attached to valve body 22 with through bolts 90. A pair of metallic holding bars 92 are provided to carry the compression loads imposed by through bolts 90. All metallic components of the assembly are isolated from the fluid flow by considerable distances of PTFE. Primary diaphragm 50 and back up diaphragm 52 are pinched and held in place by

drive housing 84. Sealing is accomplished without the need for o-rings by slightly over sizing the shoulders 62, 68, of the two diaphragms 50, 52.

Drive train 86 generally includes drive shaft 94, rotor 96, thrust bearings 98, 100, and pre-load spring 102. Drive shaft 94 threadedly connects with threaded stem 56 of flexible diaphragm structure 24, and is made from Hastelloy C22, well known for its corrosion resistance properties. Drive shaft 94 retains secondary diaphragm on threaded stem 56. Although drive shaft 94 is isolated from the process fluid by PTFE components, it can be corrosively attacked by ions leaching through the PTFE.

Rotor 96 is rotatably mounted between large diameter thrust bearing 98 and small diameter thrust bearing 100, and is rotationally fixed to drive shaft 94. Large diameter thrust bearing 98 bears the upward force exerted against valve portion 54 by the fluid flow through inlet passage 28. The upward force is generally about 105 pounds for 60 p.s.i. of fluid pressure. The rotor is provided with a pre-load biasing force in the direction opposite fluid flow by pre-load spring 102, which may be a wavy spring. Small diameter thrust bearing 100 serves to bear the downward force exerted by pre-load spring 102.

Operator 88, which may be a stepper motor 104, mounts to drive housing 84, with through bolts 90. Alternatively, two threaded spacers 106, 108, may be substituted for through bolts 90 for mounting the optional encoder/position switch 110 and actuating mechanism 112, 114. Stepper motor 104 is directly rotationally coupled with rotor 96 by a tab in the motor drive shaft (not depicted) which is engaged in a slot (not depicted) formed in rotor 96. As depicted, a coupling 116 is used to attach threaded encoder shaft 118. Shaft 118 drives threaded bushing 120 and attached cam 122 in the vertical direction corresponding with the position of diaphragms 50, 52, as positioned by motor 104. The position may be adjusted so that when diaphragms 50, 52, and valve portion 54 are closed down on projecting island 40, switch 110 will be closed.

Alternately, shaft 118, bushing 120, and cam 122 maybe replaced with a potentiometer (not depicted), or other suitable encoder.

In operation, stepper motor 104 drives rotor 96, which in turn rotates drive shaft 94, thereby selectively vertically positioning flexible diaphragm structure 24. Valve portion 54 moves vertically with flexible diaphragm structure 24 so that a throttling gap of varying size may be formed between outer peripheral surface 48 of projecting island 40 and inner peripheral surface 82 of valve portion 54. Stepper motor 104 may also be positioned so that projecting island 40 is fully engaged in recess 76, thereby closing off flow through the valve.

Please delete the entire paragraph beginning at column 4, line 14 and extending through column 4, line 34.

Please delete the entire paragraph beginning at column 4, line 35 and extending through column 4, line 49.

Please delete the entire paragraph beginning at column 4, line 50 and extending through column 4, line 67.

In the Abstract

Please replace the Abstract with the following:

A throttling valve assembly actuated by a stepper motor having a double diaphragm seal and integral throttling surface. The throttling surface interfaces to a mating orifice and port arrangement to provide a smooth control regime for various process fluids. Because of the unique design of the flow paths, the fluids will remain in a laminar flow state throughout the throttling range, thus providing smooth and continuous response to the control input. The valve

opening to the fluid is controlled by a stepper motor through a direct drive mechanism. The embodiment shown here [employees] employs all PTFE construction for the wetting parts, but any material could be used that would be compatible with the process fluid. Additional features are minimal capture of the process fluid, free draining, and no metallic parts in close communication with the process fluid.

In the Claims

Please amend claims 1-10 as follows:

1. (Amended) A free draining throttling valve comprising:

(a) a valve body defining an inlet and an outlet;

(b) a first throttling surface positioned between said inlet and outlet, said first throttling surface comprising an island having a generally annular outer peripheral surface;

(c) a diaphragm structure [having] including a primary diaphragm [surface] and a secondary diaphragm [surface], said primary and secondary diaphragms [surfaces] being spaced-apart and being joined at peripheral edges to form an internal [diaphragm] volume chamber in said diaphragm structure;

(d) said primary diaphragm having a lower surface defining a second [mating] throttling surface, said second throttling surface including an annulus with an inner peripheral surface opposing the outer peripheral surface of said island, at least a portion of said second throttling surface sealingly engageable with at least a portion of said first throttling surface [island];

(e) drive means operably coupled with [on] said diaphragm structure;

(f) operator means operably coupled [cooperable] with said drive means for selectively positioning said diaphragm structure [between an] in a flow blocking position in which the second throttling surface is sealingly engaged with the first throttling surface, thereby closing off a fluid flow through said valve, and further for selectively positioning said diaphragm structure in a plurality of open flow control positions in which a throttling gap is established between said first and second throttling surfaces, said throttling gap causing a substantially [in which a] linear pressure drop in the fluid flow [occurs] with increasing flow velocity [and a flow blocking position in which the primary diaphragm closes off flow at said island].

2. (Amended) The valve of claim 1, wherein a weep hole extends from through said valve body into said [diaphragm] internal volume chamber.

3. (Amended) The valve of claim 1, wherein said outer peripheral surface of said island [has] is tapered [side walls] and said throttling gap is between said outer peripheral surface [side walls] and said [throttling] inner peripheral surface of said annulus.

4. (Amended) The valve of claim 1, wherein said drive means comprises a threaded shaft on said diaphragm and wherein said operator means comprises a motor driven rotor in threaded engagement with said drive means.

5. (Amended) The valve of claim 4, further comprising a drive housing, and wherein said rotor is mounted in thrust bearings captured between the rotor and the drive housing.

6. (Amended) The valve of claim 1, wherein the valve body is formed from a corrosive chemical resistant material.

7. (Amended) The valve of claim 1, further comprising a drive housing, and wherein said [body has an upper and lower section and said] diaphragm structure is retained [therebetween] between said drive housing and said valve body at said peripheral edges [of said diaphragm].

8. (Amended) The valve of claim 4, wherein the [roter] rotor is driven by a stepper motor.

9. (Amended) The valve of claim 4, wherein said rotor is biased to provide a pre-load to oppose fluid pressure.

10. (Amended) The valve of claim 1, wherein said primary and secondary diaphragms [surfaces] are provided with annular ripples that deform as the diaphragm structure flexes.

Please add new claims 11-32 as follows:

11. (New) A free draining throttling valve comprising:

(a) a valve body defining an inlet and an outlet;

(b) a first throttling surface positioned between said inlet and outlet, said first throttling surface comprising an island having a generally annular outer peripheral surface;

(c) a diaphragm structure including a primary diaphragm and a secondary diaphragm, said primary and secondary diaphragms being spaced-apart and being joined at peripheral edges to form an internal volume chamber in said diaphragm structure;

(d) said primary diaphragm having a lower surface defining a second throttling surface, said second throttling surface including an annulus with an inner peripheral surface opposing the outer peripheral surface of said island, at least a portion of said second throttling surface sealingly engageable with at least a portion of said first throttling surface; and

(e) a drive assembly operably coupled with said diaphragm structure for selectively positioning said diaphragm structure in a flow blocking position in which the second throttling surface is sealingly engaged with the first throttling surface, thereby closing off a fluid flow through said valve, and further for selectively positioning said diaphragm structure in a plurality of open flow control positions in which a throttling gap is established between said first and second throttling surfaces, said throttling gap causing a substantially linear pressure drop in the fluid flow with increasing flow velocity.

12. (New) The valve of claim 11, wherein the internal volume chamber is fluidly coupled with the atmosphere through a weep hole.

13. (New) The valve of claim 11, wherein each of the primary and secondary diaphragms have annular ripples that deform as the diaphragm structure flexes.

14. (New) The valve of claim 11, wherein the drive assembly includes a drive train operably coupled with the flexible diaphragm structure and an operator operably coupled with the drive train.

15. (New) The valve of claim 14, wherein the drive train includes a threaded shaft on the flexible diaphragm structure and a rotor threadedly engaged with the threaded shaft.

16. (New) The valve of claim 15, wherein the rotor is rotatably mounted between a pair of thrust bearings.

17. (New) The valve of claim 16, wherein the rotor is biased to provide a pre-load to oppose fluid pressure.

18. (New) The valve of claim 16, wherein the operator is a stepper motor.

19. (New) The valve of claim 11, wherein the body portion is formed from chemically resistant polymer material.

20. (New) The valve of claim 19, wherein the chemically resistant polymer material is PTFE.

21. (New) A throttling valve comprising:

a body portion defining an inlet passage, an outlet passage, and a fluid cavity in fluid communication with the inlet passage and the outlet passage;

an upwardly facing valve seat disposed around the inlet passage in the fluid cavity, said valve seat comprising a projecting island having an outer surface with an outer peripheral surface portion;

a flexible diaphragm structure having a bottom surface facing into the fluid cavity so as to define the top wall of the fluid cavity, the bottom surface having a valve portion opposing the valve seat, the valve portion defining a recess adapted to receive said projecting island therein, the recess having an inner surface with an inner peripheral surface portion opposing the outer peripheral surface portion of the projecting island, the valve portion being selectively positionable with the flexible diaphragm structure in a flow blocking position wherein the valve portion is sealingly engaged with the valve seat thereby closing off a fluid flow through the valve, the valve portion being further selectively positionable in a plurality of open flow control positions wherein a throttling gap is established between the outer peripheral surface portion and the inner peripheral surface portion, the throttling gap presenting a substantially linear pressure drop in the fluid flow with increasing flow velocity therethrough; and

a drive assembly operably coupled with the flexible diaphragm structure for selectively positioning the valve portion.

22. (New) The valve of claim 21, wherein the flexible diaphragm structure includes a primary diaphragm portion and a secondary diaphragm portion, the primary and secondary diaphragm portions being spaced-apart to define an internal volume chamber in the diaphragm structure.

23. (New) The valve of claim 22, wherein the internal volume chamber is fluidly coupled with the atmosphere through a weep hole.

24. (New) The valve of claim 22, wherein each of the primary and secondary diaphragm portions have annular ripples that deform as the diaphragm structure flexes.

25. (New) The valve of claim 21, wherein the drive assembly includes a drive train operably coupled with the flexible diaphragm structure and an operator operably coupled with the drive train.

26. (New) The valve of claim 25, wherein the drive train includes a threaded shaft on the flexible diaphragm structure and a rotor threadedly engaged with the threaded shaft.

27. (New) The valve of claim 26, wherein the rotor is rotatably mounted between a pair of thrust bearings.

28. (New) The valve of claim 27, wherein the rotor is biased to provide a pre-load to oppose fluid pressure.

29. (New) The valve of claim 25, wherein the operator is a stepper motor.

30. (New) The valve of claim 21, wherein the body portion is formed from chemically resistant polymer material.

31. (New) The valve of claim 30, wherein the chemically resistant polymer material is PTFE.

32. (New) A process for throttling a fluid flow comprising steps of:

directing the fluid flow through a valve, the valve including a valve seat comprising a projecting island having an outer surface with an outer peripheral surface portion, and further including a selectively positionable valve portion opposing the valve seat, the valve portion defining a recess adapted to receive said projecting island therein, the recess having an inner surface with an inner peripheral surface portion opposing the outer peripheral surface portion of the projecting island; and

selectively positioning the valve portion so as to establish a throttling gap between the outer peripheral surface portion and the inner peripheral surface portion so that the

throttling gap presents a substantially linear flow resistance with increasing flow velocity therethrough.